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Researchers develop system enabling force protection and active range clearance

by Timothy R. Anderl, Materials and Manufacturing Directorate

TYNDALL AIR FORCE BASE, Fla. — Engineers at the Air Force Research Laboratory have developed a robotic platform that enables the Air Force community to accomplish its most harrowing munitions disposal and range maintenance missions.

AFRL's Airbase Technologies Division Robotics Research Group, part of the Office of the Secretary of Defense (OSD) Joint Robotics Program, developed the All-Purpose Remote Transport System (ARTS) in cooperation with Air Combat Command and the 99th Civil Engineering Group, Nevada Test Ranges. The robotic technology, which is multi-mission capable and unmanned, has established its value during range clearance operations, and demonstrates great potential in force protection, fire fighting, natural disaster clean-up, foul-weather operations, range remediation, and active range clearance.

The All-Purpose Remote Transport System (ARTS) is a tool developed to protect warfighters from hazardous situations, and to provide them with a robust suite of tools with which they can accomplish force protection and active range clearance activities while staying out of "harm's way." The system is designed to provide explosive ordnance personnel with remote stand-off distances to perform submunition and mine clearance operations. (Air Force photo)

"The purpose of ARTS is to reduce the risk to warfighters responding to real-world situations and accomplishing critical Air Force mission goals," Walter M. Waltz, the Robotics Group Leader said. "While there are specific tools used for active range clearance and force protection, the 'all-purpose' nature of ARTS allows for interoperability across multiple missions."

ARTS is a modified version of a construction tractor, the Posi-Track MD70. The platform has a diesel engine that delivers power to the 18-inch wide, Kevlar-reinforced rubber tracks. The tracks have over 3,000 square inches of contact area, resulting in ground contact pressure of approximately two pounds per square inch. In addition, a remotely operated pintle hitch on the platform provides the capability to tow and release a payload.

"This vehicle profile allows for a low center of gravity and light footprint, which makes it rugged, reliable, and the perfect candidate for range operations because it minimizes forces that could detonate sensitive munitions," Waltz said.

Directorate researchers also developed the robotics control package. The package enables remote operation of all tractor functions. The standard configuration includes provisions for four fixed video cameras. A pair of digital radios transmit command signals from the operator control unit (OCU), which resides a safe distance from dangerous operations, to the vehicle. An independent transmitter/receiver pair communicates audio and video from the vehicle to the OCU.

To meet urgent and compelling requirements in Southwest Asia and in Europe, Waltz said the directorate transitioned an

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ARTS "build to print" technical documentation package to Vertek Inc. for production and support. Vertek engineers built 18 units that were distributed worldwide.

The directorate also distributed the technical transition package to the Air Armament Center's Engineering Manufacturing and Development System Program Office, the office responsible for final configuration and maintenance of the system. Currently, 41 ARTS units are fielded throughout the Air Force and an additional 22 units are scheduled for production.

The Air Force operates several bombing ranges where pilots train by dropping lethal anti-armor/anti-personnel weapons. Periodically, EOD teams must clear debris, such as bomb fragments, from the range. Past methods required the teams to walk the area, manually cleaning the range. Air Force explosive ordnance disposal (EOD) personnel now use the system to perform a variety of range clearance and unexploded ordnance (UXO) tasks such as clearing sub-munitions using a surface clearance blade, and towing a trailer and remotely disconnecting it.

When the United States transferred ownership of the Panama Canal back to the Panamanian government, the Air Force had to clear UXOs from ranges at Howard Air Base, which pilots used during the 1960s and 1970s. Ten-foot-tall jungle grass had overgrown the target area, and any surface UXO presented EOD personnel with a tremendous challenge. Clearing such ranges required personnel to burn the foliage, but jungle grass has the tendency to fold over and not burn thoroughly. In order to properly clear Howard AB using this method, personnel would have to saturate the area with a burning agent, and burn the foliage to an acceptable level to where EOD personnel could clear the UXOs.

Because the ARTS comes with a variety of tools, including a brush cutter mower and a two-bottom plow to turn the soil, EOD personnel used it to mow the jungle grass and remove surface UXOs. They then turned the soil to expose any UXOs that were hiding under the ground's surface. They cleared the range, meeting the closure treaty requirements, and the Panamanian government accepted the land.

"Based on feedback from users in the field, the directorate is continually developing and integrating new attachments for the ARTS to meet mission requirements where normal, conventional procedures could have been used, but would have put the technician in harm's way," Waltz said.

"The ARTS' largest success has been in the acquisition strategy," Waltz said. Initially developed in late 1995, the directorate transitioned ARTS to support worldwide missions in less than 5 years. At the beginning of development, no requirement documents, transition plans, or procurement money existed. Through constant input from the field, and compelling mission needs, ARTS has evolved into an adaptable, multi-purpose tool that provides the capability to complete their missions. @